

THE TAXONOMIC PLACEMENT OF SEVERAL NEW WORLD AND ORIENTAL GASTERUPTIID WASPS (HYMENOPTERA: GASTERUPTIIDAE)

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Abstract.—The generic placement of several New World and Oriental gasteruptiid wasps is reviewed. Based on a number of character states, including non-overlapping mandibles (when at rest), the presence of a trochantellus (prefemur) and an exerted ovipositor, and the pattern of the veins in the forewing, five species currently in *Pseudofoenus* are transferred to *Gasteruption* L.; namely *G. longiceps* (Kieffer 1910), **n. comb.**, *G. ceylonensis* (Enderlein 1912), **n. comb.**, *G. maculicorne* Cameron 1887, **revised comb.**, *G. sericeum* Cameron 1887, **revised comb.**, and *G. tenuicolle* Schletterer 1885, **revised comb.** In addition, *G. longiceps* (Kieffer 1910) is a junior secondary homonym of *G. longiceps* Kieffer 1904 and is renamed ***G. austini***, **n. name**, and *Pseudofoenus neotropicus* Schrottky 1906 is placed as *incertae sedis*.

Key Words: Hymenoptera, Gasteruptiidae, Gasteruptiinae, *Gasteruption*, *Pseudofoenus*

Members of the family Gasteruptiidae are predator-inquilines of solitary bees and wasps, and are currently divided into two subfamilies, Gasteruptiinae, comprising the single genus *Gasteruption* L., and Hyptiogasterinae comprising two genera, *Hyptiogaster* Kieffer and *Pseudofoenus* Kieffer (Jennings and Austin 2002).

Pseudofoenus was described by Kieffer (1902) to accommodate three *Gasteruption* species (*P. unguiculatum* (Westwood), *P. unguicularae* (Smith), and *P. pedunculatum* (Schletterer)), all from New Zealand. In his revision of 1912, Kieffer included 16 species, while the catalog by Hedicke (1939) included 17 species. However, both Kieffer and Hedicke had a broad concept of *Pseudofoenus* that failed to distinguish convergent wing venation among members of the

Gasteruptiidae (see Jennings and Austin 2002).

In the 1950s, a number of taxa described in *Pseudofoenus* were transferred to *Gasteruption*. Pasteels (1956) transferred *P. azurescens* Szépligeti, *P. braunsi* Kieffer, *P. keifferi* Szépligeti, *P. latigenalis* (Schletterer), *P. nasutus* Szépligeti, and *P. virescens* (Enderlein); Pasteels (1957) transferred *P. fluvialis* Turner, *P. cylindricus* Turner, and *P. isthmialis* Turner; and Pasteels (1958) transferred *P. manilensis* Kieffer.

Crosskey (1962), in a comprehensive re-assessment of the Gasteruptiidae, provided much needed stability to the generic classification that lasted for 40 years. Based primarily on wing venation, he included only five species from New Zealand in *Pseudo-*

foenus; *P. crassipes* (Smith), *P. nocticolor* Kieffer, *P. pedunculatus* (Schletterer), *P. unguicularis* (Smith), and *P. unguiculatus* (Westwood). He also transferred *P. angustatus* Kieffer from Mexico to *Gasteruption*. Later, *P. kaweahensis* (Bradley) from North America was transferred to *Gasteruption* by Carlson (1979). Jennings and Austin (1994) revised *Pseudofoenus* but largely adapted Crosskey's concept of the genus. Interestingly, the four included species, *P. crassipes*, *P. nocticolor*, *P. pedunculatus*, and *P. unguiculatus*, represent the male and female of only two sexually dimorphic species, but to date it has not been possible to properly associate them.

Following a substantial phylogenetic revision of the mainly Australian subfamily Hyptiogastrinae, Jennings and Austin (2002) redefined the limits of *Pseudofoenus* to include all hyptiogastrine wasps with a short, robust, upwardly curved ovipositor, normally hidden by ovipositor sheaths. They included 78 species from Australia, New Zealand, Papua New Guinea, southwestern Pacific islands (Fiji, New Caledonia, and Vanuatu), and South America. Those hyptiogastrines with an exerted ovipositor were included in the Australian genus *Hyptiogaster* (Jennings and Austin 1997a).

However, several New World and Oriental taxa previously included in *Pseudofoenus* by Hedicke (1939) have not been examined since, and their generic position has remained in doubt. They are: *P. maculicornis* (Cameron) and *P. sericeus* (Cameron) from Guatemala, *P. longiceps* Kieffer and *P. neotropicus* Schrottky from Paraguay, and *P. tenuicollis* (Schletterer) from Mexico. Further, and overlooked by Hedicke (1939), the generic placement of *P. ceylonensis* Enderlein, 1912, from Sri Lanka is also in doubt. Here, we present the results of a re-interpretation of these taxa and discuss their placement in the Gasteruptionidae.

METHODS, TERMINOLOGY AND ABBREVIATIONS

Specimens were observed either under a Zeiss light microscope or a NZ16 Leica light microscope equipped with a Nikon DXM 1200 digital camera. Images were processed with Auto-Montage 4.02.

Terminology for wing venation follows the modified Comstock-Needham system after Sharkey (1988), with some modifications, including Achterberg's (1979) nomenclature for cells (Fig. 1; also see Jennings and Austin 1994).

Abbreviations for institutional repositories cited in this paper are: BMNH (The Natural History Museum, London, United Kingdom) and DEI (Deutsches Entomologisches Institut, Müncheberg, Germany). In an attempt to locate types, we contacted many other collections that may have been the repository of type material.

KEY TO SUBFAMILIES OF GASTERUPTIIDAE

The Gasteruptionidae are currently divided into two subfamilies, Gasteruptioninae, comprising the single species-rich genus *Gasteruption* L. and Hyptiogastrinae comprising two genera, *Hyptiogaster* and *Pseudofoenus* (see Jennings and Austin 2002 for diagnoses and discussion of the two subfamilies). The two subfamilies may be identified using the following key.

1. Mandibles long and broadly overlapping when in closed position; trochantellus (prefemur) absent; first discal cell formed by forewing vein 1-Rs+M intersecting basal cell about one-quarter to one-third distance from M+Cu (see Fig. 1c) or, rarely, first discal cell absent and veins 1-Rs+M and 1-Cu(b) fused to form Rs+M+Cu(b), veins 1-M and m-cu absent (see Fig. 1b) [New Zealand hyptiogastrines only]; female subgenital sternite simple; hind trochanter with or without a groove; ovipositor usually short and hidden at rest (*Pseudofoenus*), or exposed and at least 0.25 length of metasoma (*Hyptiogaster*) Hyptiogastrinae
- Mandibles short and not broadly overlapping when in closed position; trochantellus (prefemur) usually present (Figs. 2a, b), sometimes indicated by a slightly differentiated basal swelling; first discal cell formed by forewing

vein 1-Rs+M forming node at 1-Rs, M+Cu and 1-Cu, vein 1-M absent (see Fig. 1a) [several species with 1m-cu absent, or nearly so, such that the first discal cell is triangular]; female subgenital sternite notched or slit; hind trochanter with a groove; ovipositor long, at least 0.5 length of metasoma (*Gasteruption*)
 Gasteruptioninae

TREATMENT OF SPECIES

Gasteruption austini Jennings and Smith, new name

Pseudofoenus longiceps Kieffer 1910: 242; Kieffer 1912: 207; Hedicke 1939: 46.

Holotype.—Missing. Kieffer (1910) described a female from Villa Morra, Paraguay, 19 Dec. 1904, collected by J. D. Ansisits.

Based on Kieffer's (1910) original description, the forewing venation of *P. longiceps* is atypical of the majority of *Gasteruption* in lacking the first discal cell, and thus resembles the New Zealand taxa *P. crassipes* (Smith) (Fig. 1b) and *P. pedunculatus* (Schletterer). Crosskey (1962) and Jennings and Austin (1994) discuss the possible evolutionary pathways leading to the loss of the first discal cell. Other than those taxa from New Zealand, all hyptiogastrines have the first discal cell formed by forewing vein 1-Rs+M intersecting the basal cell about one-quarter to one-third the distance from M+Cu (Jennings and Austin 2002). Kieffer (1910) also indicated that the ovipositor is exserted and about the same length as the metasoma. Given the combination of having an exserted ovipositor and the pattern of the wing venation, we transfer *P. longiceps* to *Gasteruption*, **n. comb.** As the species epithet is a junior secondary homonym of *G. longiceps* Kieffer 1904 from Western Australia, we propose the new replacement name *P. austini*, after Prof. Andrew Austin, The University of Adelaide.

Gasteruption ceylonensis (Enderlein), **n. comb.**

Pseudofoenus ceylonensis Enderlein 1912: 388; Hedicke 1939: 45.

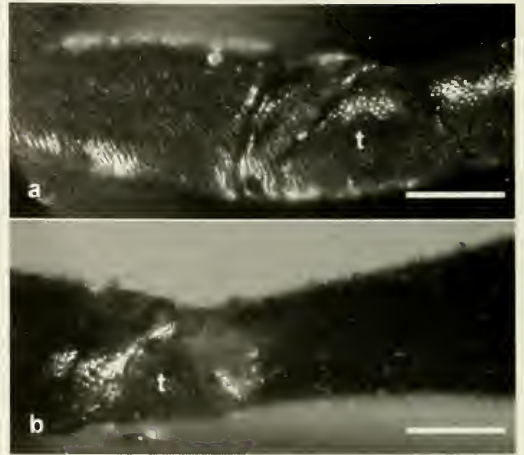


Fig. 2. Hind trochanter and femur. a, *Gasteruption ceylonensis*, ♀, holotype. b, *G. sericeum*, ♀, showing trochantellus (prefemur). t = Trochantellus. Scale bars: a = 0.5 mm, b = 1.0 mm.

Holotype.—♀, “Penilankulam (illeg.), Ceylon, W. Horn, [18]99” (DEI). Poor condition; most of the antennal segments and metasoma missing. Enderlein (1912) indicated that the holotype was deposited in Vienna, but this was an error.

Although the forewing venation of this species is atypical of most *Gasteruption* in that the first discal cell is absent (see Fig. 1b), there is, however, a distinct trochantellus on the hind leg (Fig. 2a) and the mandibles do not overlap at rest. Unfortunately, the ovipositor is missing on the holotype, but Enderlein (1912) indicated in the original description that it is clearly exserted beyond the tip of the metasoma. Based on these character states, we transfer it to *Gasteruption*.

Gasteruption maculicorne Cameron, **revised comb.**

Gasteruption maculicorne Cameron 1887: 424, pl. 18, fig. 5; Schletterer 1889: 475. *Pseudofoenus maculicornis*: Kieffer 1912: 207; Hedicke 1939: 46. (Note: Bradley 1909: 109 stated *maculicorne*, but in error on p. 194, he corrected it to *sericeum*; therefore, *maculicorne* on p. 109 is a mistake.)

Holotype.—♀ “Calderas, Guatemala, Champion” (BMNH 3.a.198). Poor condition; most of the antennal segments, right forewing, and metasoma missing. Left forewing glued to card.

Cameron (1887) described this species in *Gasteruption*, but Kieffer (1912) transferred it to *Pseudofoenus*. It clearly belongs in *Gasteruption* based on the forewing venation, which is typical of the majority of *Gasteruption* (see Fig. 1a), the presence of a trochantellus on the hind leg, and mandibles that do not overlap at rest. Although the ovipositor is missing on the holotype, Cameron's figure (1887: pl. 18, fig. 5) shows that it is exerted well beyond the tip of the metasoma. On the basis of these character states, we return this species to *Gasteruption*.

Gasteruption sericeum Cameron,
revised comb.

Gasteruption sericeum Cameron 1887: 424, pl. 18, figs. 3, 4; Schletterer 1889: 473; Kieffer 1902: 10.

Rhydinofoenus sericeus: Bradley 1909: 39.

Pseudofoenus sericeus: Bradley 1908: 109, 194 (as *maculicorne* on p. 109, corrected to *sericeus* on p. 194); Kieffer 1912: 208; Hedicke 1939: 46.

Syntypes.—Missing. Described from both sexes; thus, Cameron had two or more specimens, but no holotype was designated. The type locality is San Gerónimo, Guatemala.

This species, originally described in *Gasteruption*, was transferred to *Pseudofoenus* by Bradley (1908) and then to *Rhydinofoenus* Bradley by Bradley (1909), based largely on the lack of forewing vein 1m-cu, resulting in the absence of the first discal cell. *Rhydinofoenus* was later synonymised with *Pseudofoenus* (Hedicke 1939). Although the syntypes are apparently missing, there are three specimens in the BMNH, 1 ♀ and 2 ♂ from San Gerónimo, Guatemala, collected by Champion. Because Cameron (1887) described both sexes, these with

Cameron's determination label in his handwriting undoubtedly are part or all of the type series and may not have been separated as types in the BMNH.

Although the forewing venation of this species is atypical of most *Gasteruption* (see Fig. 1b), it has a distinct trochantellus on the hind leg (Fig. 2b) and the mandibles do not overlap at rest, both characteristic of *Gasteruption*. The original description and Cameron's figure (1887: pl. 18, fig. 3) clearly indicate that the ovipositor is 1.5× as long as the metasoma (Cameron 1887). On the basis of these character states, we return this species to *Gasteruption*.

Gasteruption tenuicolle Schletterer,
revised comb.

Gasteruption tenuicolle Schletterer 1885: 291; Schletterer 1889: 471; Kieffer 1902: 10.

Pseudofoenus tenuicollis: Szépligeti 1903: 365; Kieffer 1912: 205; Hedicke 1939: 46.

Holotype.—Missing. Schletterer (1885) described a female from “Mexiko (Orizaba, Bilimek).”

This species was originally placed in *Gasteruption* (Schletterer 1885) but later transferred to *Pseudofoenus* by Szépligeti (1903). The original description (Schletterer 1885) indicates that the ovipositor is exerted, and based on this we transfer this species back to *Gasteruption*.

In the DEI collection, there is a female from San José, Costa Rica, collected by Heinr. Schmidt, 2.x.[19]27 and labelled as *tenuicolle*. The forewing venation of this specimen is typical of most *Gasteruption* in that the first discal cell is formed by vein 1-Rs+M resulting in a node at 1-Rs, M+Cu and 1-Cu, and vein 1-M is absent (see Fig. 1a). In addition, it has a trochantellus on the hind leg and mandibles that do not overlap at rest, and an exerted ovipositor. Although we are not convinced that the specimen has been correctly identified, it clearly belongs to *Gasteruption*.

Pseudofoenus neotropicus Schrottky

Pseudofoenus neotropicus Schrottky 1906: 62; Kieffer 1912: 206; Hedicke 1939: 46.

Holotype.—Missing. Described from a male collected 28 Jan 1905, from “Villa Encanación,” Paraguay.

This species was originally placed in *Pseudofoenus* (Schrottky 1906), presumably based on forewing venation, i.e., the absence of vein 1m-cu resulting in the absence of the first discal cell. This form of wing venation is, however, not found in either of the two South American species of *Pseudofoenus*, *P. deletangi* (Schletterer) or *P. infumatus* (Schletterer), both of which have a typical hyptiogastrine wing pattern (see Fig. 1a) (Jennings and Austin 1997b, 2002). In all probability, this species belongs in *Gasteruption*. However, as the holotype is missing, no extant specimens can be found that match the original description, and the lack of evidence relating to, in particular, wing venation and whether the ovipositor is exerted, we place this species in *incertae sedis*.

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